DIODES, VOLTAGE REGULATORS,

BASED ON TYPE 1N3821A THROUGH 1N3828A

AND IN3016B THROUGH IN3051B

ESCC Detail Specification No. 5102/015

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ESA/SCC Detail Specification No. 5102/015

space components
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DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference / CHANGE Item	Approved DCR No.
		This issue incorporates all modifications agreed on the basis of Policy DCR No. 21022 for adaptation to new ESA/SCC Generic Specification 5000 Issue 4 April 1982 requirements.	
'A'	July '93	P1. Cover Page	None
		P2. DCN	None
		P11. Para. 4.2.2 : PIND deviation amended	21043
		: Die Shear Test deviation deleted	23499
		Para. 4.2.3 : Radiographic Inspection deviation amended	21049
		Para. 4.2.4 : Die Shear Test deviation deleted	23499
		This document has been transferred from hardcopy to electronic format. The content is unchanged but minor differences in presentation exist.	

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1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for a Diode, Voltage Regulator, based on Types 1N3821A to 1N3828A and 1N3016B to 1N3051B.

It shall be read in conjunction with ESA/SCC Generic Specification No. 5000, the requirements of which are supplemented herein.

1.2 COMPONENT TYPE VARIANTS

Variants of the basic diodes specified herein, which are also covered by this specification, are given in Table 1(a).

1.3 MAXIMUM RATINGS

The maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the diodes specified herein, are scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

The derating information applicable to the diodes specified herein is shown in Figure 1.

1.5 PHYSICAL DIMENSIONS

The physical dimensions of the diodes specified herein are shown in Figure 2.

1.6 FUNCTIONAL DIAGRAM

The functional diagram, showing lead identification, of the diodes specified herein, is shown in Figure 3.

TABLE 1(a) - TYPE VARIANTS

(1) Variant	(2) Voltage group	(3) V_Z Nom. (Volts)	(4) V_Z Min. (Volts)	(5) V_Z Max. (Volts)	(6) I_Z Test current (mA)	(7) Z imped-ance (Ohms)	(8) Z_K knee imped-ance (Ohms)	(9) I_Z Max dc current (mA)	(10) ΔBV Voltage regulat. (Volts)	(11) I_R (surge) T_A = +25°C (mA)	(12) V_R Reverse Voltage (Volts)	(13) I_R Reverse dc (μA)	(14) I_R Reverse dc (μA)	(15) TCBV Temp. coeff. (%/°C)	(16) I_K Test Current (mA)
01	1N3821A	3.3	3.14	3.46	76	10	400	276	1.0	1380	1.0	100	200	-0.075	1.0
02	1N3822A	3.6	3.42	3.78	69	10	400	252	0.8	1260	1.0	100	200	-0.070	1.0
03	1N3823A	3.9	3.71	4.09	64	9.0	400	238	0.75	1190	1.0	50	100	-0.060	1.0
04	1N3824A	4.3	4.09	4.51	58	9.0	400	213	0.7	1070	1.0	10	20	-0.050	1.0
05	1N3825A	4.7	4.47	4.93	53	8.0	500	194	0.6	970	1.0	10	20	±0.025	1.0
06	1N3826A	5.1	4.85	5.35	49	7.0	550	178	0.5	890	1.0	10	20	±0.030	1.0
07	1N3827A	5.6	5.32	5.88	45	5.0	600	162	0.4	810	2.0	10	20	+0.040	1.0
08	1N3828A	6.2	5.89	6.51	41	2.0	700	146	0.3	730	3.0	10	20	+0.050	1.0
09	1N3016B	6.8	6.46	7.14	37	3.5	700	140	0.3	740	5.2	150	300	+0.057	1.0
10	1N3017B	7.5	7.13	7.87	34	4.0	700	125	0.35	680	5.7	100	200	+0.061	0.5
11	1N3018B	8.2	7.79	8.61	31	4.5	700	115	0.4	600	6.2	50	100	+0.065	0.5
12	1N3019B	9.1	8.65	9.55	28	5.0	700	105	0.45	540	6.9	25	50	+0.068	0.5
13	1N3020B	10	9.5	10.5	25	7.0	700	95	0.5	480	7.6	25	50	+0.071	0.25
14	1N3021B	11	10.45	11.55	23	8.0	700	85	0.55	420	8.4	10	20	+0.073	0.25
15	1N3022B	12	11.40	12.60	21	9.0	700	80	0.6	400	9.1	10	20	+0.076	0.25
16	1N3023B	13	12.35	13.65	19	10	700	74	0.65	370	9.9	10	20	+0.079	0.25
17	1N3024B	15	14.25	15.75	17	14	700	63	0.75	320	11.4	10	20	+0.082	0.25
18	1N3025B	16	15.20	16.80	15.5	16	700	60	0.8	300	12.2	10	20	+0.083	0.25
19	1N3026B	18	17.10	18.90	14.0	20	750	52	0.83	260	13.7	10	20	+0.085	0.25
20	1N3027B	20	19.0	21.0	12.5	22	750	47	0.95	240	15.2	10	20	+0.086	0.25
21	1N3028B	22	20.9	23.1	11.5	23	750	43	1.0	210	16.7	10	20	+0.087	0.25
22	1N3029B	24	22.8	25.2	10.5	25	750	40	1.1	200	18.2	10	20	+0.088	0.25
23	1N3030B	27	25.7	28.3	9.5	35	750	34	1.3	170	20.6	10	20	+0.090	0.25
24	1N3031B	30	28.5	31.5	8.5	40	1000	31	1.4	160	22.8	10	20	+0.091	0.25
25	1N3032B	33	31.4	34.6	7.5	45	1000	28	1.5	150	25.1	10	20	+0.092	0.25

TABLE 1(a) - TYPE VARIANTS (CONT'D)

(1) Variant	(2) Voltage group	(3) V_Z Nom. (Volts)	(4) V_Z Min. (Volts)	(5) V_Z Max. (Volts)	(6) I_Z Test current (mA)	(7) Z imped-ance (Ohms)	(8) Z_K knee imped-ance (Ohms)	(9) I_Z Max dc current (mA)	(10) ΔBV Voltage regulat. (Volts)	(11) I_R (surge) T_A = +25°C (mA)	(12) V_R Reverse Voltage (Volts)	(13) I_R Reverse dc (μA)	(14) I_R Reverse dc (μA)	(15) TCBV Temp. coeff. (%/°C)	(16) I_K Test Current (mA)
26	1N3033B	36	34.2	37.8	7.0	50	1000	26	1.7	130	27.4	10	20	+0.093	0.25
27	1N3034B	39	37.1	40.9	6.5	60	1000	23	1.8	110	29.7	10	20	+0.094	0.25
28	1N3035B	43	40.9	45.1	6.0	70	1500	21	1.9	100	32.7	10	20	+0.095	0.25
29	1N3036B	47	44.7	49.3	5.5	80	1500	19	2.1	95	35.8	10	20	+0.095	0.25
30	1N3037B	51	48.5	53.5	5.0	95	1500	18	2.3	90	38.1	10	20	+0.096	0.25
31	1N3038B	56	53.2	58.8	4.5	110	2000	17	2.5	85	42.6	10	20	+0.096	0.25
32	1N3039B	62	58.9	65.1	4.0	125	2000	15	2.7	75	47.1	10	20	+0.097	0.25
33	1N3040B	68	64.6	71.4	3.7	150	2000	14	3.0	70	51.7	10	20	+0.097	0.25
34	1N3041B	75	71.3	78.7	3.3	175	2000	12	3.3	63	56	10	20	+0.098	0.25
35	1N3042B	82	77.9	86.1	3.0	200	3000	11	3.6	58	62.2	10	20	+0.098	0.25
36	1N3043B	91	86.5	95.5	2.8	250	3000	10	4.0	50	69.2	10	20	+0.099	0.25
37	1N3044B	100	95.0	105	2.5	350	3000	9.0	4.4	45	76	10	20	+0.1	0.25
38	1N3045B	110	104.5	115.5	2.3	450	4000	8.3	5.0	42	83.6	10	20	+0.1	0.25
39	1N3046B	120	114	126	2.0	550	4500	8.0	5.5	40	91.2	10	20	+0.1	0.25
40	1N3047B	130	123.5	136.5	1.9	700	5000	6.9	6.0	35	98.8	10	20	+0.1	0.25
41	1N3048B	150	142.5	157.5	1.7	1000	6000	5.7	7.0	29	114	10	20	+0.1	0.25
42	1N3049B	160	152	168	1.6	1100	6500	5.4	8.0	27	121.6	10	20	+0.1	0.25
43	1N3050B	180	171	189	1.4	1200	7000	4.9	10	25	136.8	10	20	+0.1	0.25
44	1N3051B	200	190	210	1.2	1500	8000	4.6	12	23	152	10	20	+0.1	0.25

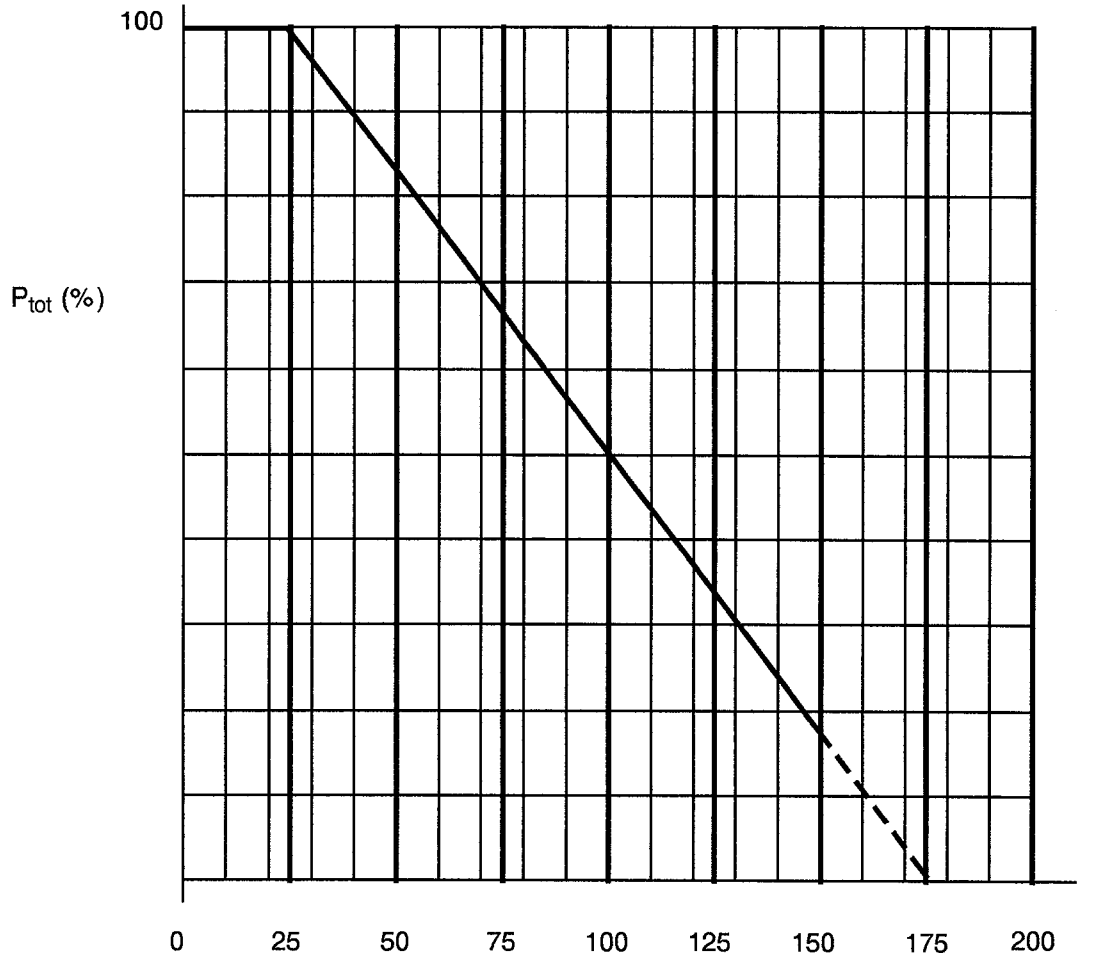
TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTIC	SYMBOL	MAXIMUM RATING	UNIT	REMARKS
1	Power Dissipation	P_{tot}	1.0	W	$T_{amb} \leq +25°C$ See Note
2	Operating Temperature Range	T_{op}	−55 to +150	°C	T_{amb}
3	Storage Temperature Range	T_{stg}	−65 to +175	°C	
4	Soldering Temperature	T_{sol}	+260	°C	Time: ≤10 seconds; Distance from case: ≥ 1.5mm

NOTES

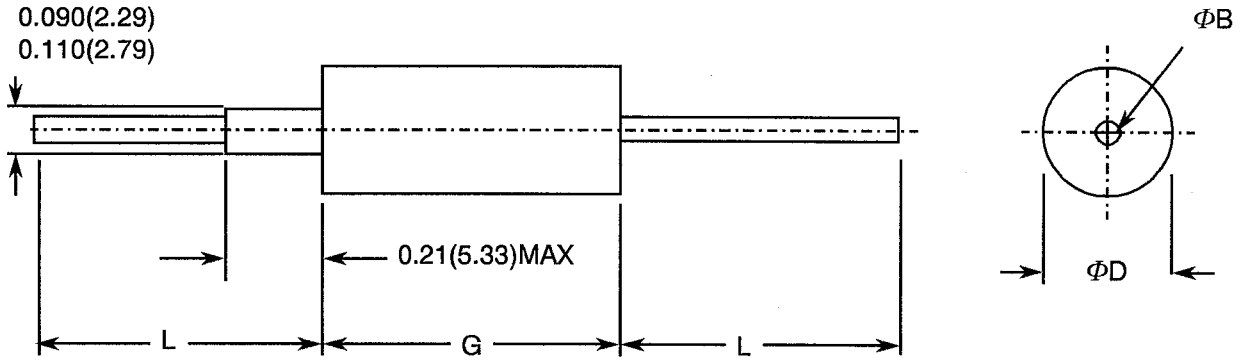
1. The leads shall be maintained at ambient temperature 4.0mm from the body.

FIGURE 1 - PARAMETER DERATING INFORMATION



Power Dissipation Versus Temperature

FIGURE 2 - PHYSICAL DIMENSIONS

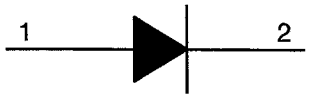


SYMBOL	INCHES		MILLIMETRES		NOTES
	MIN.	MAX.	MIN.	MAX.	
ΦB	0.026	0.035	0.66	0.89	-
ΦD	0.215	0.265	5.46	6.73	3
G	0.195	0.35	4.95	8.89	-
L	1.0	-	25.40	-	-

NOTES

1. Metric equivalents (to the nearest 0.01mm) are given for general information only and are based upon 1 inch = 25.4mm.
2. Metric equivalents are in parentheses.
3. Dimension ∅D shall be measured at the largest diameter.
4. Cathode lead shall be electrically connected to the case. If tubulation is used, it shall be on the anode end.

FIGURE 3 - FUNCTIONAL DIAGRAM



1. Anode
2. Cathode

NOTES

1. The cathode end shall be marked with a coloured ring.

2. APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:-

(a) ESA/SCC Generic Specification No. 5000 for Discrete Semiconductors.

(b) MIL-STD-750, Test Methods and Procedures for Semiconductor Devices.

(c) MIL-STD-1276, Leads, Weldable, for Electronic Component Parts.

3. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESA/SCC Basic Specification No. 21300 shall apply.

4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the diodes specified herein are stated in this specification and ESA/SCC Generic Specification No. 5000 for Discrete Semiconductors. Deviations from the Generic Specification applicable to this specification only, are listed in Para. 4.2.

Deviations from the applicable Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESA/SCC requirements and do not affect the components' reliability, are listed in the appendices attached to this specification.

4.2 DEVIATIONS FROM GENERIC SPECIFICATION

4.2.1 Deviations from Special In-process Controls

None.

4.2.2 Deviations from Final Production Tests (Chart II)

(a) Para. 9.7, Particle Impact Noise Detection (PIND) Test: Not applicable.

(b) Para. 9.2.1, Bond Strength Test: Not applicable.

(c) Para. 9.5, Thermal Shock Test: To be performed according to MIL-STD-202, Test Method 107, Test condition 'B'.

4.2.3 Deviations from Burn-in and Electrical Measurements (Chart III)

(a) Para. 7.1.1(a), H.T.R.B. Test: Shall not be performed.

(b) Para. 9.12, Radiographic Inspection: Not applicable.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Bond Strength Test: Shall not be performed.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

None.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the diodes specified herein shall be checked. They shall conform to those shown in Figure 2.

4.3.2 Weight

The maximum weight of the diodes specified herein shall be 1.3 grammes.

4.3.4 Terminal Strength

The requirements for terminal strength testing are specified in Section 9 of ESA/SCC Generic Specification No. 5000. The test conditions shall be as follows:-

Test Condition : 'A'.
Applied Force : 5.0 Newtons.
Duration : 10 seconds

4.4 MATERIALS AND FINISHES

The materials and finishes shall be as specified herein. Where a definite material is not specified, a material which will enable the diodes specified herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material does not guarantee acceptance of the finished product.

4.4.1 Case

Glass, hermetically sealed.
Metal, hermetically sealed.

4.4.2 Lead Material and Finish

The leads shall be gold-plated KULGRID in accordance with MIL-STD-1276.

4.5 MARKING

4.5.1 General

The marking of all components delivered to this specification shall be in accordance with the requirements of ESA/SCC Basic Specification No. 21700. Each component shall be marked in respect of:-

(a) Lead Identification.

(b) The SCC Component Number.

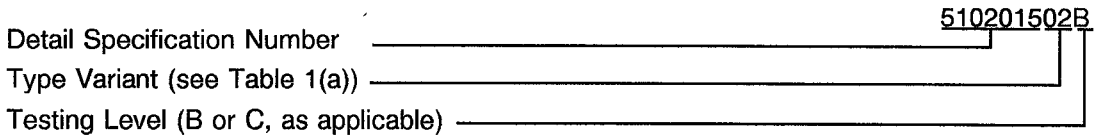
(c) Traceability Information.

4.5.2 Lead Identification

Lead identification shall be as shown in Figures 2 and 3 of this specification.

4.5.3 The SCC Component Number

Each component shall bear the SCC Component Number which shall be constituted and marked as follows:



4.5.4 Traceability Information

Each component shall be marked in respect of traceability information in accordance with the requirements of ESA/SCC Basic Specification No. 21700.

4.5.5 Marking of Small Components

When it is considered that the component is too small to accommodate the marking as specified above, as much as space permits shall be marked. The order of precedence shall be as follows:-

(a) Lead Identification.

(b) The SCC Component Number.

(c) Traceability Information.

The marking information in full shall accompany each component in its primary package.

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured at room temperature are scheduled in Table 2. The measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.6.2 Electrical Measurements at High and Low Temperatures

The parameters to be measured at high and low temperatures are scheduled in Table 3.

4.6.3 Circuits for Electrical Measurements

Circuits for use in performing the electrical measurements listed in Tables 2 and 3 of this specification are shown in Figure 4.

4.7 BURN-IN TESTS

4.7.1 Parameter Drift Values

The parameter drift values applicable to burn-in are specified in Table 4 of this specification. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +22 \pm 3$ °C. The parameter drift value (Δ) applicable to the parameters scheduled, shall not be exceeded. In addition to these drift value requirements, the appropriate limit value specified in Table 2 for a given parameter shall not be exceeded.

4.7.2 Conditions for Burn-in

The requirements for burn-in are specified in Section 7 of ESA/SCC Generic Specification No. 5000. The conditions for burn-in shall be as specified in Table 5 of this specification.

4.7.3 Electrical Circuits for Burn-in

Circuits for use in performing the burn-in tests are shown in Figure 5 of this specification.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - d.c. PARAMETERS

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	Zener Voltage	V_Z	MIL-STD-750 Method 4022	I_Z = (1) mA	(2)	(3)	V
2	Reverse Current	I_R	MIL-STD-750 Method 4016	V_R = (4) V	-	(5)	µA

NOTES

1. See Table 1(a), Column 6.
2. See Table 1(a), Column 4.
3. See Table 1(a), Column 5.
4. See Table 1(a), Column 12.
5. See Table 1(a), Column 13.

a.c. PARAMETERS

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	Small Signal Breakdown Impedance	Z_Z	MIL-STD-750 Method 4051	I_Z = (1)	-	(2)	Ω
2	Knee Impedance	Z_K	MIL-STD-750 Method 4051	I_{ZK} = (4)	-	(3)	Ω

NOTES

1. See Table 1(a), Column 6.
2. See Table 1(a), Column 7.
3. See Table 1(a), Column 8.
4. See Table 1(a), Column 14.

FIGURE 4 - TEST CIRCUITS

Not applicable.

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITION	LIMITS		UNIT
					MIN.	MAX.	
1	Reverse Current	I_R	MIL-STD-750 Method 4016.2	T_{amb} = +150 °C V_R = (1)	-	(2)	µA

NOTES
1. See Table 1(a), Column 12.
2. See Table 1(a), Column 14.

TABLE 4 - PARAMETER DRIFT VALUES

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITION	CHANGE LIMITS (Δ)	UNIT
1	Zener Voltage	V_Z	MIL-STD-750 Method 4022	I_Z = (1) mA	±5.0	%
2	Reverse Current	I_R	MIL-STD-750 Method 4016	V_R = (2)	±100 or (3) ±100	% nA

NOTES
1. See Table 1(a), Column 6.
2. See Table 1(a), Column 12.
3. Whichever is greater.

TABLE 5 - CONDITIONS FOR BURN-IN

No.	CHARACTERISTIC	SYMBOL	CONDITION	UNIT
1	Ambient Temperature	T_{amb}	+25 (see Note)	°C
2	Working Current	I_{Zmax}	See Table 1(a), Column 9	mA

NOTES
1. The leads shall be maintained at ambient temperature 4.0mm from the body.

FIGURE 5 - ELECTRICAL CIRCUIT FOR BURN-IN

Not applicable.

4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESA/SCC GENERIC SPECIFICATION NO. 5000)

4.8.1 Electrical Measurements on Completion of Environmental Tests

The parameters to be measured on completion of environmental tests are scheduled in Table 2. The measurements shall be performed at $T_{amb} = +22 \pm 3$ °C.

4.8.2 Electrical Measurements at Intermediate Points and on Completion of Endurance Tests

The parameters to be measured at intermediate points and on completion of endurance testing are scheduled in Table 6.

4.8.3 Conditions for Operating Life Tests (Part of Endurance Testing)

The requirements for operating life testing are specified in Section 9 of ESA/SCC Generic Specification No. 5000. The conditions for operating life testing shall be the same as specified in Table 5 for the burn-in test.

4.8.4 Electrical Circuits for Operating Life Tests

The circuit to be used for performance of the operating life test shall be the same as shown in Figure 5 for burn-in.

4.8.5 Conditions for High Temperature Storage Test (Part of Endurance Testing)

The requirements for the high temperature storage test are specified in ESA/SCC Generic Specification No. 5000. The temperature to be applied shall be the maximum storage temperature specified in Table 1(b) of this specification.

TABLE 6 - ELECTRICAL MEASUREMENTS AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITION	LIMITS		UNIT
					MIN.	MAX.	
1	Zener Voltage	V_Z	MIL-STD-750 Method 4022	I_Z = (1)	(3)	(2)	V
2	Reverse Current	I_R	MIL-STD-750 Method 4016	V_R = (4)	(5)	-	µA

NOTES

1. See Table 1(a), Column 6.
2. See Table 1(a), Column 4.
3. See Table 1(a), Column 5.
4. See Table 1(a), Column 12.
5. See Table 1(a), Column 13.